

COURSE TITLE:

Foundations of Energy

UNIT TITLE:

Renewable Energy–Hydropower

SECTION 1: General Information and Overview

Grade Level:

9-12

Suggested Number of Lessons:

8-10

Suggested Time to Complete Unit:

10-15 Class periods

Unit Overview:

This unit focuses on hydroelectric power. Students will expand their knowledge of hydroelectric power by studying trends in streams, rivers, tidal, ocean currents technology.

SECTION 2: Essential Questions

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| 1. | What role does hydropower play in the state, regional and national energy portfolio? |
| 2. | What role does hydropower play in our economy of the past, present and future? |
| 3. | In what ways are hydropower and the water table important to society? |

SECTION 3: Major Focus

Technical Content CTE Program of Studies	Learner Activities (Enabling Knowledge and Skills/Processes)	Core Content For Assessment	Academic Expectations
Construction Technology KOSSA Standard AD-002: Demonstrate the ability to learn new processes and steps. 2.1-- Assess the impact of various current and new technologies on the economy.	Using the provided PDF files in the <i>Hydropower unit</i> , research current and new policies in the energy industry for understandings of current energy trends and the impact on our nation's energy portfolio and economy at the state and national level. Participate in an icebreaker provided by the teacher on the topic, <i>Hydropower</i> . Then review the key terms from the activity: <ul style="list-style-type: none">Hydro	SC-HS-4.6.8 Students will: <ul style="list-style-type: none">describe the connections between the functioning of the Earth system and its sources of energy (internal and external);Predict the consequences of changes to any component of the Earth system. Earth systems have sources of energy that are internal and external to the Earth. The Sun	2.1 Students understand scientific ways of thinking and working and use those methods to solve real-life problems.

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<p>6.2--Describe the difference between potential and kinetic energy.</p>	<ul style="list-style-type: none"> • Hydropower • Dam • Penstock • Wicket gate • Fish Ladder <p>Explain the role each term has on energy.</p> <p>Read information provided in the <i>student guide backgrounder</i> on current and new hydropower policies.</p> <p>Review a map of the US; mark locations of current hydro facilities and mark potential locations of hydro facilities.</p>	<p>is the major external source of energy. Two primary sources of internal energy are the decay of radioactive isotopes and the gravitational energy from Earth’s original formation. DOK 3</p>	
<p>Construction Technology KOSSA Standard AD-003: Implement new processes given oral instructions.</p> <p>2.1-2.3--Engaging in meaningful hands-on, minds-on conceptual based activities in the area of energy technologies.</p>	<p>Using the resource files on the CD and the Hydropower Kit, explore and identify various models of electrical turbines.</p> <p>Build a basic electrical generator using materials provided in the kit.</p> <p>Test the model with various meters. Discuss ways to improve the model built using various engineering design concepts. That information will be assessed in the activities by working with the hydro kit and building operational models.</p>	<p>SC-HS-4.6.7 Students will:</p> <ul style="list-style-type: none"> • explain real world applications of energy using information/data; • evaluate systems using current scientific knowledge about energy. <p>The universe become less orderly and less organized over time. Thus, the overall effect is that the energy is spread out uniformly. For example, in the operation of mechanical systems, the useful energy output is always less than the energy input; the difference appears as heat. DOK 2</p>	<p>2.2 Students identify, analyze and use patters such as cycles and trends to understand past and present events and predict possible future events.</p>
<p>Construction Technology KOSSA Standard EA-005: Display initiative.</p>	<p>Using the resource CD and hands –on activities explore hydro energy around the world, and marine tidal energy, review public perspectives on the laws and investigate and interpret</p>	<p>SC-HS- 4.6.4 Students will:</p> <ul style="list-style-type: none"> • describe the components and reservoirs involved in biogeochemical cycles (water, nitrogen, carbon dioxide and oxygen); 	<p>2.3 Students identify and analyze systems and the ways their components work together or affect each other.</p>

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<p>1.5-6.2--Apply concepts of mathematics, science, social studies, and communications in the context of energy.</p>	<p>findings in relation to cost. Develop a power point of 12-15 slides of their research and findings of the hydropower industry, its associated careers, and its economic impact in the state and nation.</p> <p>Develop a 2-3 page descriptive report on a specific career of their choosing related to the hydropower industry.</p>	<ul style="list-style-type: none"> • Explain the movement of matter and energy in biogeochemical cycles and related phenomena. <p>The total energy of the universe is constant. Energy can change forms and/or be transferred in many ways, but it can neither be created nor destroyed. Movement of matter between reservoirs is driven by Earth’s internal and external sources of energy. These movements are often accompanied by a change in physical and chemical properties of the matter. Carbon, for example, occurs in carbonate rocks such as limestone, in the atmosphere as carbon dioxide gas, in water as dissolved carbon dioxide and in all organisms as complex molecules that control the chemistry of life.</p> <p>DOK 3</p>	<p>2.4 Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.</p>
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SECTION 4: Culminating Project with Scoring Guide

Students will participate in building bench top hydro-electric power supply and compete in teams of 4 for the model with the most voltage production and demonstrate lab safety guidelines.

SCORING GUIDE:

CATEGORY	4	3	2	1
CONTENT	EXTENSIVE-CONTENT BEYOND WHAT IS TAUGHT IN CLASS	GOOD-EXPLANATION OF CONCEPTS COVERED IN CLASS	BASIC – WHAT HAS ALREADY BEEN COVERED IN CLASS	LIMITED- DOESN’T COVER MATERIAL AS WELL AS DONE IN CLASS
TECHNOLOGY	EXTENSIVE-POWER POINT WITH EXCELLENT ANIMATION AND PICTURES	APPROPRIATE-POWER POINT HAS SOME ANIMATION AND PICTURES	BASIC- POWER POINT WITH LITTLE ANIMATION AND PICTURES	LIMITED – POWER POINT WITH NO ANIMATION OR PICTURES
PRESENTATION	EXCELLENT-FLOWS WELL, AUDIENCE VERY ATTENTIVE- WELL REHEARSED	GOOD – FLOWS WELL PARTICIPANTS KNOW MATERIAL WELL	BASIC – FLOWS UNEVENLY MAY HAVE SOME READING OF NOTES OR SLIDES	LIMITED- PARTICIPANTS READ FROM NOTES OR SLIDES
INTEREST	EXTENSIVE – PARTICIPANTS	APPROPRIATE – ENCOURAGES	BASIC – CAN FIELD SOME QUESTIONS	LIMITED – GLAD TO BE THROUGH WITH

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	MAKE MANY EXTENSIONS AND EXPLANATIONS	QUESTIONS AND COMMENTS		THE PRESENTATION
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SECTION 5: Assessment and Enabling Skills and Processes

Assessment:	Participation in building bench top hydroelectric power supply and design challenge in teams. Each student in the team will assume a lead role in the project. Develop a team power point presentation of 10 slides and present to the class.
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SECTION 6: Support Materials (i.e., Resources, Technology, and Equipment)

A. Resources	NEED Materials, hydropower kit
B. Technology	Personal and shop tools and equipment
C. Websites (samples of many available)	WWW.NEED.ORG ; WWW.DOE.GOV ; WWW.EIA.GOV
D. Equipment	Equipment designated in the hydropower kit